

Building Performance Improvement Board

11/9/2022

Agenda

- Administrative items
- Recap actions from previous meeting
- Building groups discussion and decision points:
 - Building groups
 - "Special cases"
 - Adjustment criteria
 - Mixed-Use Buildings
 - "Other" Buildings
- Site EUI Target Setting Basics



Administrative Items

Board Purpose

Role of Building Performance Improvement Board

- 1. Generally advise the Department on implementation of building energy performance standards.
- 2. Advise DEP on regulations for implementing the Building Energy Performance Standards
- 3. Recommend complementary programs or policies, with particular attention to assistance or accommodations for challenged or under-resourced sectors, such as affordable housing, non-profit organizations, and small businesses
- 4. (Eventually) Help make determinations about unique situations

Team Ground Rules

- Full engagement during meetings
- Listen carefully
- Don't speak while others are speaking or interrupt others
- Let everyone speak once before you speak twice
- Follow meeting agendas and respect common ground rules
- Review action items at the conclusion of each meeting
- Value other members' time (e.g., stick to meeting times and agenda topics, avoid off-topic tangents)
- Assume positive intent
- Maintain an open mind to other perspectives than your own
- Maintain mutual respect for one another
- Engage in respectful conflict
- Critique the idea, not the person
- Don't take yourself too seriously and enjoy our time together

Reminders

- Board members must:
 - Complete and sign the Volunteer Form and return it to Emily 87% complete
 - Take the <u>Parliamentary Procedure: Roberts Rule of Order, Newly Revised, 10th Edition Online Training</u>
 <u>Course</u> and upload completion certificate <u>here</u> 53% complete
 - Take the MD Open Meetings Act Training and upload completion certificate here 60% complete
- Trainings must be done before the end of 2022

Actions

Approve meeting notes



Previous Meeting Recap

Action Items

- How other jurisdictions are grouping buildings
- Concept of adjustments for certain criteria



Building Groups

Building Groups Overview

- Law says, "Covered buildings within each building type must have shared characteristics that facilitate the implementation and enforcement"
- Building groups inform the reference standard:
 - Preference to use the local median of the group if there are enough buildings
 - If small number, use national reference CBECS data adjusted to local climate
- Some buildings may have unique circumstances regardless of how groups are set. Buildings could apply for limited target adjustments based on defined criteria.
- Mixed-use buildings can employ an area-weighted target

Action Items – Groups in Other Jurisdictions

Other jurisdictions using a site EUI target generally use Portfolio Manager groupings if there enough buildings in a group to set a target and then roll up into CBECS categories where there is not enough local data

- <u>St. Louis</u>: To ensure that the standards for each property type could be set based on data from a sufficiently large number of buildings (determined by the Board to be 10 buildings), the Board categorized property types into larger groupings based on the groupings used by the EPA to determine a building's ENERGY STAR Score (AKA CBECS)
 - BEPS technical report also considered 10 buildings to be the threshold to use local data in most cases
- <u>Denver</u>: The 82 ESPM property types present in Denver were grouped into 55 building types based on CBECS microdata building types.
 - 17 building types had >25 buildings and use the Portfolio Manager Property Type. For the remaining 38 categories with fewer than 25 large buildings in the Denver data set, the 2012 CBECS microdata was utilized to determine the target EUI.
- Washington State: 113 categories based on Energy Star Portfolio Manager with specific Washington state
 amendments
 - Using American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 100-2018 as a base

Action Items – Groups in Other Jurisdictions

- **DC**: Based on ENERGY STAR score, not site EUI (<u>more info on groups here, Appendix B</u>)
 - Property types that can receive ENERGY STAR score and have >10 buildings get median of that Portfolio Manager property type.
 - Property types that can receive Score but have <10 properties are grouped with other type of same scoring model (e.g., Bank Branch, Financial Office, and Office all use Office median).
 - Properties without ENERGY STAR score are grouped by "Reference Data Source Peer Group Comparison" field in EPA Portfolio Manager National Median Technical Reference. For most property types, the reference data is from the Commercial Building Energy Consumption Survey (CBECS).

Building Group Options

	Portfolio Manager Calculated Property Type (80+ types)	CBECS Principal Property Type (16 types)	Potential Solution
Ease of understanding	Pro: More direct relationship to what's entered in Portfolio Manager	Pro: Simpler set of types Con: Too simplistic/broad?	A table can be provided to map ESPM type to CBECS/BEPS category in regs
Data availability	Con: Likely to have few buildings in each group Add'l analysis would be needed to determine median for each ESPM group and target options.	Pro: Generally avoids smaller groups to allow for use of local data to find the median. BEPS technical report uses as basis for target options.	Custom solution – Sub-group if sample size and EUI suggests different enough uses to warrant a separate group; CBECS group if small sample and/or similar EUI Wait to set standards for some groups? – some groups, MF, warehouse, senior care, etc will have more available data following benchmarking period. Options: • Wait to set targets for these types until more local data is collected • Revise targets in the future as more data becomes available, but could create uncertainty.
Alignment with other jurisdictions	Pro?: DC mostly uses Portfolio Manager type, but with an already different standard does it matter?	Unclear what MD state will use, but they may lean towards narrower categories given the larger reference set	As long as ESPM type and local BEPS group are listed, finding the target for that group should be simple.
Potential for outliers within groups	PM property type may contain other space (e.g., Office could contain up to 50% other types)	Tends to have more types in each groups so some buildings may be more challenged and others less so	Some buildings may have unique circumstances regardless of how groups are set. Buildings could apply for limited target adjustments based on defined criteria ("extensions/adjustments for all buildings")

Property Types, Sample Sizes, and Median EUIs

Portfolio Manager Type – # in analysis – Median EUI	CBECS Type	Estimated # Covered	DEP Suggestion
Adult Education – 0 College/University – 19 – Median EUI = 104 Other – Education – 0 Pre-school/Daycare – 0 Vocational School – 0	Education – 19 Median EUI = 104	5	Suggest keeping broad. Reference includes Montgomery College which is not covered.
 K-12 School – 118 Public schools – 109 – Median EUI = 55 Private schools – 9 – Median EUI = 62 	Education - K-12 School – 118 Median EUI = 55	47	Only private schools are covered. Reference includes MCPS.
Food Sales – 0 Supermarket/Grocery Store – 12 – Median EUI = 202 Wholesale Club/Supercenter – 1 – EUI = 149	Food Sales – 13 Median EUI = 202	26	Suggest keeping broad.
Bar/Nightclub Food Service Other - Restaurant/Bar – 1 – EUI = 257 Restaurant	Food Service – 1 CBECS EUI = 271	0	Unlikely to be stand-alone bldgs 25k+ gsf, useful for an area-weighted calc.
Hospital (General Medical & Surgical) – 4 – Median EUI = 305 Other - Specialty Hospital	Health care Inpatient – 4 Median EUI = 305	7	Suggest one group given few hospitals in County
Ambulatory Surgical Center Medical Office – 26 – Median EUI = 74 Outpatient Rehab/Physical Therapy Urgent Care/Clinic/Other Outpatient – 2 – Median EUI = 82 Veterinary Office	Health care Outpatient – 28 Median EUI = 73	53	Close enough to suggest keeping broad

Portfolio Manager Type – # in analysis – Median EUI	CBECS Type	Estimated # Covered	DEP Suggestion
Hotel – 22 – median EUI = 75 Other - Lodging/Residential Residence Hall/Dormitory Senior Living Community Senior Care Community – 9 – median EUI = 106 Residential Care Facility	Lodging – 32 Median EUI = 87	88	Suggest splitting residential from care types (gray)
Enclosed Mall – 1 – EUI = 33 Lifestyle Center – 1 – EUI = 166 Other – Mall – 11 – EUI = 122 Strip Mall – 26 – EUI = 101	Mercantile Enclosed and strip malls – 39 Median EUI = 111	113	Strip malls less likely to be covered in future due to new building definition, but the enclosed mall is an outlier.
Automobile Dealership – 4 – Median EUI = 111 Retail Store – 15 – Median EUI = 59	Mercantile Retail (other than mall) – 18 Median EUI = 62	120	Create 2 groups? Mercantile Enclosed + Retail (blue) and Strip Mall/Other (gray)
Multifamily Housing – 417 - Low-rise – median EUI = 62 - Old-tall – median EUI = 64 - New-tall – median EUI = 48	Multifamily – 417 Median EUI = 62	594	From DC. Potential EUI targets, use highest targets from 3 subgroups
Bank Branch Financial Office – 1 – EUI = 62 Office – 188 – median EUI = 63	Office – 198 Median EUI = 63	445	Suggest keeping broad
Data Center – 1 – EUI = 170 Laboratory – 9 – median EUI = 264 Manufacturing/Industrial Plant Other – 9 – median EUI = 57	Other – 19 Median EUI = 235	38	"Other" seems to be mis-reported. These buildings may be well suited for adjustments or BPIPs given energy demands. No Manufacturing/Industrial reports received yet could create subgroup if data warrants it

Portfolio Manager Type – # in analysis – Median EUI	CBECS Type	Estimated # Covered	DEP Suggestion
Bowling Alley Convention Center Fitness Center/Health Club/Gym – 4 – median EUI = 95 Ice/Curling Rink – 2 – median EUI = 148 Indoor Arena Library – 2 – median EUI = 88 Movie Theater – 1 – EUI = 88 Museum – 1 – EUI = 42 Other - Entertainment/Public Assembly Other – Recreation – 2 – median EUI = 121 Other – Stadium, Stadium (Closed), Stadium (Open) Performing Arts – 5 – median EUI = 102 Social/Meeting Hall Swimming Pool	Public Assembly – 17 Median EUI = 106	65	Some types may never have a building reported. Small sample sizes for each PM type, but some variation noted. Keep one but allow adjustments for high-intensity uses like ice rinks, indoor pools.
Courthouse – 1 – EUI = 101 Fire Station – 1 – EUI = 98 Other – Public Services Police Station Prison/Incarceration	Public Order and Safety – 2 CBECS EUI = 86	22	Public buildings, suggest keeping broad. Could reclassify "prison/incarceration" to higher intensity group if data shows a need to do that.
Worship Facility – 10 – Median EUI = 57	Religious Worship – 10 Median EUI = 57	110	
Other – Services – 1 – EUI = 74 Personal Services (Health/beauty, dry cleaning, etc) Repair Services (vehicle, shoe, locksmith, etc)	Service – 1 CBECS EUI = 62	8	Somewhat unlikely to be 25k+ gsf alone but may be useful for mixed-use targets
Distribution Center Non-Refrigerated Warehouse – 5 – Median EUI = 30 Parking Refrigerated Warehouse Self-Storage – 5 – Median EUI = 14	Warehouse and Storage – 10 Median EUI = 19	327	No refrigerated warehouses reported yet; warehouses previously exempt. Separate category for refrigerated warehouse? Wait to set target until add'l reports come in?

Decision Point

- Covered buildings within each building type must have shared characteristics that facilitate the implementation and enforcement of this Article
- Do we agree that the groupings in the prior slides fulfill this need for most buildings?
 - CBECS groups where noted (in green)
 - Lodging split into 2 types: Residential Lodging and Care Lodging
 - Retail split into 2 types: Mercantile Enclosed/Retail and Strip Mall/Other Retail
 - "Other"1 group with option to create a separate Manufacturing and Industrial category if additional data becomes available
 - Public Order and Safety 1 group with option to move Prison/Incarceration if data warrants it
 - Warehouse and storage 1 group with option to create a Refrigerated Warehouse category if additional data becomes available

Special Cases

- Adjustment criteria
- Mixed-use buildings
- "Other" buildings

Action Items – Adjustment Criteria

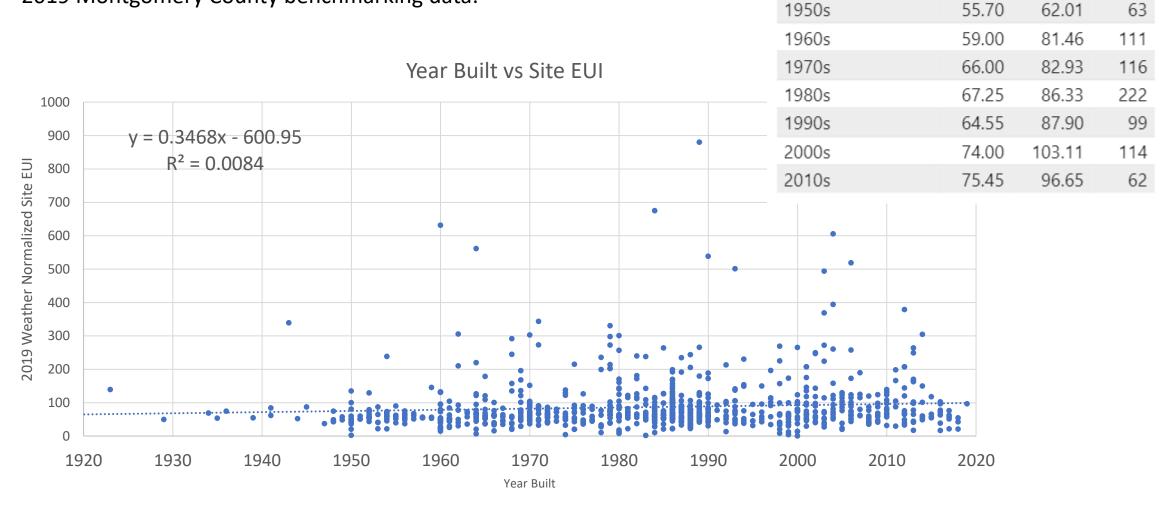
- Mention during last meeting of the following as potential adjustment criteria:
 - Building age data available in benchmarking
 - Operating hours (e.g., for buildings with 24/7 operation and/or strict reliability requirements) data available in benchmarking
 - Equipment (e.g., for medical office buildings or other specialized buildings) data not available in benchmarking and likely isolated within building types and eligible for a BPIP "circumstance out of owner's control"
 - Metering configuration (whether tenant or landlord pays for utilities) data not available in benchmarking

Other Jurisdiction (Denver) Building Adjustments

- Denver also considering adjustments for:
 - Significant variations in operations or inherent characteristics of the building itself.
 - Operating hours (for Office, Retail Store, Worship Facility, Non-refrigerated Warehouse, Refrigerated Warehouse, Supermarket/Grocery Store only)
 - Parking energy use that is not able to be excluded from benchmarking
 - Parking SF is not included in total building floor area for site EUI calculations, but energy is included if it cannot be removed from total energy use. Buildings with large/energy intense enclosed parking may be suited for an adjustment
 - Swimming pools (ice rinks could be treated similarly)
 - Data centers
 - Previous benchmarking submission were incorrect:
 - building type classification
 - square footage corrections
 - inaccurate energy data that affects the baseline
 - Building alterations
 - Building type has changed due to a renovation
 - Building has added or demolished square footage with a different or high-intensity property type

Building Age vs Site EUI

- Across building types, age does not correlate with site EUI
- No jurisdiction providing an adjustment for building age
- 2019 Montgomery County benchmarking data:



Year Built (groups)

<1950

Median Average Count

146.56

25

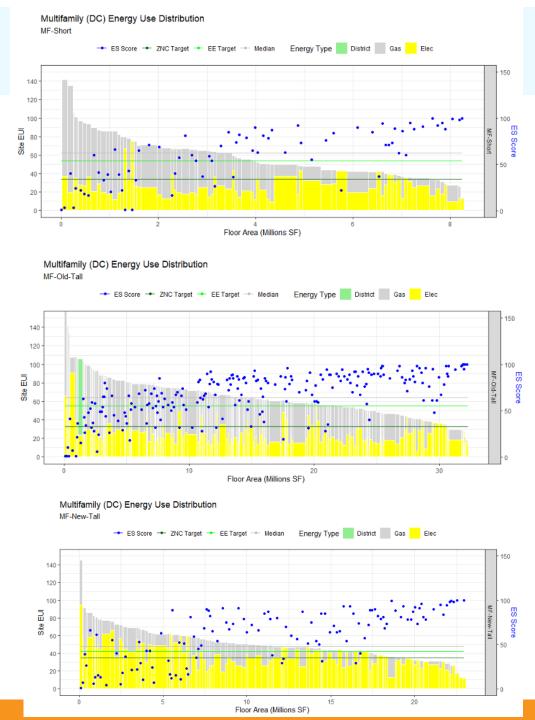
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Building Age vs Site EUI

- In MF group, the "old-tall" type had a higher median EUI vs "new-tall" (64 vs 48)
- For EUI standard setting, "old-tall" had the highest EE target and "new-tall" had the highest NZC target, so the highest EUI targets for the group were used as the reference standard for setting targets as to not disadvantage one MF type

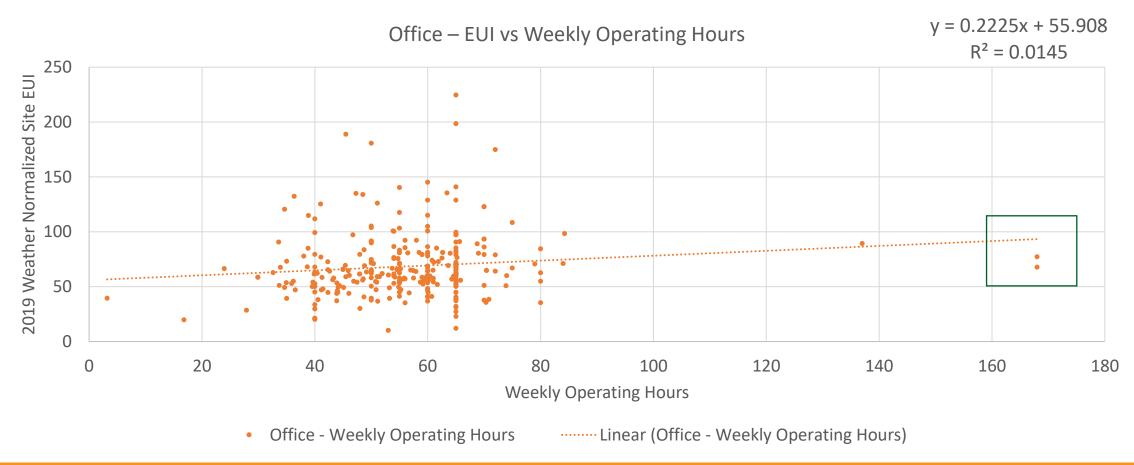
Median in	MF-Short	MF-Old-	MF-New-	MF-AII
kBTU/SF		Tall	Tall	highest of the three
Median EUI	62	64	48	64

	ets in U/SF	MF-Short	MF-Old- Tall	MF-New- Tall	MF-All highest of the three for each target
EE T	arget	54	55	42	55
ZNC	Target	34	33	35	35



Operating Hours vs Site EUI

- Few office buildings reporting 24/7 operation those with are not necessarily higher than other offices
- Slight upward trend in site EUI with higher operating hours but still not statistically significant
- Could still be considered for an adjustment for some property types (like Denver) but further research needed on appropriate way to adjust



Decision Point

- Consensus that target adjustments should be made available?
- Others not discussed that DEP should consider?

Mixed-Use Buildings

- In ESPM, to be classified as a "Mixed-Use Property", the building contains multiple property types, none of which are greater than 50% of the total Gross Floor Area (GFA), including parking GFA.
 - 30 buildings reported as "Mixed Use Property" in 2021
 - Many other buildings have one primary space >50% of floor area, but with one or more secondary spaces
 - Portfolio Manager only provides gross floor area for 3 largest space types in buildings
 - Parking SF is not included in total building floor area for site EUI calculations, but energy is included if it cannot be removed from total energy use

• Questions:

- Under what circumstances to apply an area-weighted target to buildings, including those that are <u>NOT</u> classified as Mixed-Use Property in ESPM
- How and whether to apply target calculation

Mixed-Use Buildings, Other Jurisdictions

- **St. Louis**: The primary property type calculated for each submission is used to define site EUI targets. A single submission receives a **single target based on the primary property use type**, without a blending of targets for mixed-use spaces
 - Potential benefit = simplicity; City doesn't need to tell building owners what their mixed target is
- Denver: Draft technical guidance: Mixed-use buildings have a blended target based on the percentage of Gross Floor Area assigned to the largest three building types in the 2019 benchmarking data.
- Boston: Buildings or Building Portfolios with more than one primary use may comply with a blended CO2e Emissions standard; provided, however, that a use may constitute a primary use only if it (i) occupies at least ten percent (10%) of a Building's or Building Portfolio's square footage, or (ii) accounts for more than ten percent (10%) of a Building's or Building Portfolio's total annual Energy use or CO2e Emissions.
 - Potential benefit = blended target reflective of building use and may provide more realistic targets

Examples Using other Jurisdictions' Methodologies

- Example: 57,689 gsf "Office" containing 3 space types: Office, Restaurant, Retail Store
 - Office = 53,030 gsf; ZNC office target = 53
 - Restaurant = 3,525 gsf; ZNC food service target = 171
 - Retail Store = 1,134 gsf; ZNC Retail (other than mall) target = 45

	Mixed-Use Methodology	Target (ZNC)
St Louis	No blending for mixed-use	53
Denver	Blended target based on % of GFA assigned to 3 largest building types	60
Boston	Blended standard if space occupies at least 10% of building's GFA	53 (2 nd spaces not >10% so no blending)

Examples Using other Jurisdictions' Methodologies

- Example: 65,450 gsf "Mixed-Use Property" containing 4 space types: Laboratory, Office, Parking,
 Restaurant
 - Laboratory = 31,277 gsf; ZNC lab target ("other") = 167
 - Office = 22,953 gsf; ZNC office target = 53
 - Parking = 22,130 gsf
 - Parking not considered since it doesn't get added in to building GFA
 - As 4th largest use, ESPM does not provide restaurant GFA

	Mixed-Use Methodology	Target (ZNC)
St Louis	No blending for mixed-use	167
Denver	Blended target based on % of GFA assigned to 3 largest building types	119 (2 largest building types blended)
Boston	Blended standard if space occupies at least 10% of building's GFA	119 (2 nd space >10% so same as Denver)

Decision Point

- Should mixed-use targets be provided?
- If so, which methodology is preferred?
 - Like Denver 3 largest space types
 - Like Boston largest types >10% of area
 - Other?

"Other" buildings

- "Other" refers to buildings that do not fall within the available property use categories in Portfolio Manager.
 - PM: "Before selecting Other, it is highly recommended that you review the full list of property uses available for selection to ensure that there is not a suitable category for your property."
- Only 8 buildings reported as "Other" in 2021, but most look like they could fit into a group and are being misreported
- Options:
 - Buildings reported as "Other Other" contacted to report correctly or placed into a category by DEP if not clearly an "Other" CBECS property type. Building owner retains right to challenge grouping.
 - Truly "other" buildings? Very challenging not to fit into one of ESPM's 83 categories. Handle on a case-by-case basis, potentially providing:
 - Guidance on choosing an appropriate type (e.g. "Equestrian facility" not a property type in Portfolio
 Manager but could advise in technical guidance which ESPM option is the best suited property type)
 - The same kind of area-weighting like for any mixed-use building if building uses allow it
 - A custom target based on the building's historical energy use and common standard-setting methodology

Decision Point

- Comfortable with these approaches?
 - Buildings reported as "Other Other" contacted to report correctly or placed into a category by DEP if not clearly an "Other" CBECS property type. Building owner retains right to challenge grouping.
 - Truly "other" buildings? Very challenging not to fit into one of ESPM's 83 categories. Handle on a case-by-case basis, potentially providing:
 - Guidance on choosing an appropriate type (e.g. "Equestrian facility" not a property type in Portfolio Manager but could advise in technical guidance that "Other Recreation" is the best suited property type)
 - The same kind of area-weighting like for any mixed-use building if building uses allow it
 - A custom target based on the building's historical energy use and common standard-setting methodology

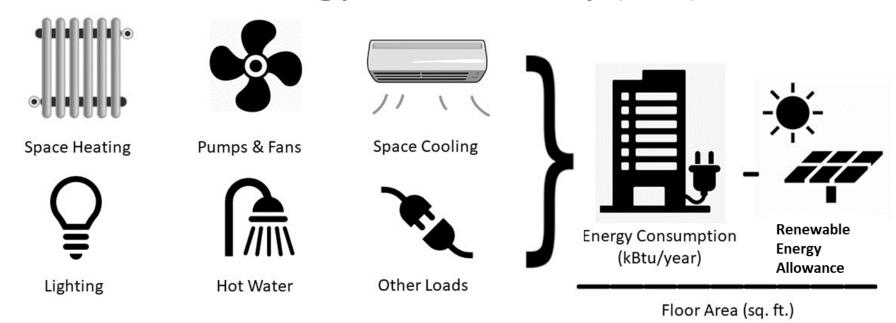


EUI Target Setting Basics

Basics of Site Energy Use Intensity (site EUI)

- Site energy use is calculated by dividing the total energy consumed by the building in one year (measured in kBtu) by the total gross floor area of the building (measured in square feet)
- Stakeholders favored EUI as a performance metric because it is within the building owner's control, is easy to calculate from utility bills and understand, and enables comparisons between different sized buildings
- Performance metric includes a renewable energy allowance

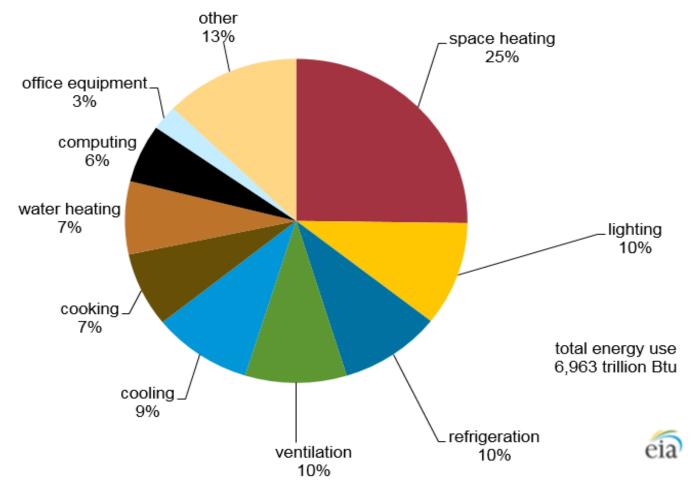
Site Energy Use Intensity (EUI)



3,

How is energy used in buildings?

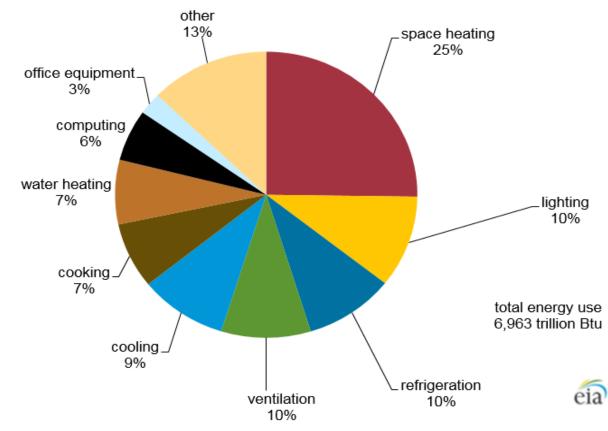
• Varies by building type, but typically, heating, air conditioning, ventilation, and refrigeration (HVAC-R) is 40-50% of the energy use...



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey.

What types of energy power these end uses?

- Most all buildings use electricity from the grid for some end uses
 - Lighting, plug loads, cooling (usually)
 - Heating, hot water heating, and cooking can be electric as well
- Some buildings have on-site combustion systems that use natural gas (most commonly), fuel oil, propane, steam, etc for heating, domestic hot water heating, and cooking needs

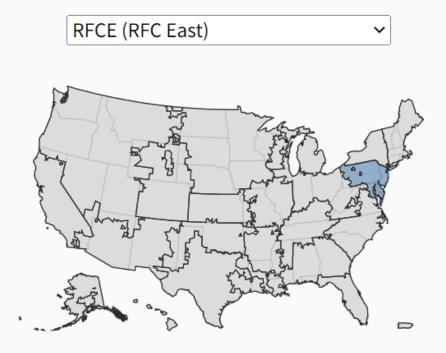


Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey.

What is an electric grid?

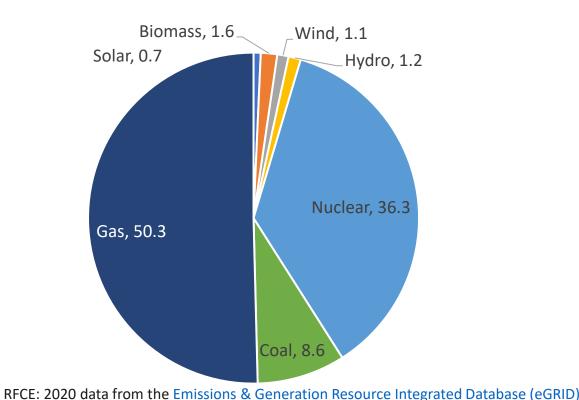
- An electrical grid is an interconnected network for electricity delivery from producers to consumers.
- Maryland is in the "PJM" interconnection territory a regional transmission organization (RTO) that coordinates the movement of wholesale electricity.
- There are 27 eGRID subregions in the US. The subregions are defined to limit the amount of imports and exports across regions in order to best represent the electricity used in each of the subregions.





How is electricity generated?

- Electricity is produced by many different sources of energy. The type and amount of emissions produced depend on how electricity is generated in the region.
- RFC East eGrid breakdown:



- Between 2005 and 2021, carbon intensity rates fell by about 35% across the PJM. PJM states continue to use cleaner, more energy efficient fuels and continue to replace older, less efficient units.
- State has "renewable portfolio standard (RPS)" goal to increase mix of renewable generation in grid to 50% by 2030. Mix relies on other states' goals as well since we are interconnected.

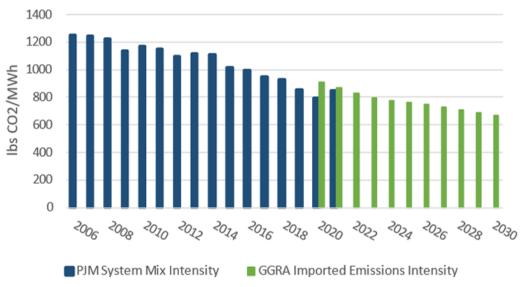
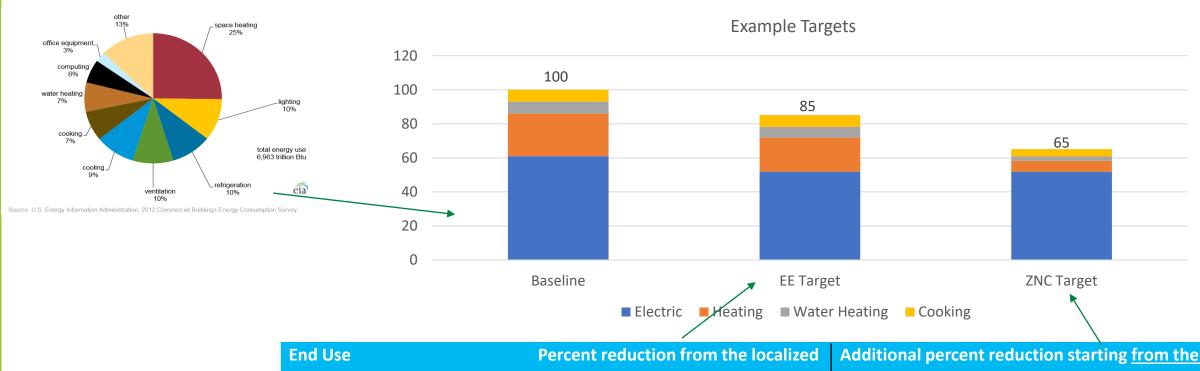


Figure 20. Historical carbon intensity of electricity in the PJM system and 2030 GGRA Plan projections. (Click figure to return).

Source: GGRA 2022 Progress Report

Back to Site EUI Target Methodology

- Looking at each building type, we can estimate the energy end uses like the pie chart breakdown
- From there, apply standard reduction targets to different end uses based on what is achievable through energy efficiency (EE target) or energy efficiency + electrification (ZNC target) for each end use to arrive at whole-building site EUI targets



End Use	Percent reduction from the localized	Additional percent reduction starting <u>from the EE</u>
	median EUI for EE target	target for ZNC target
Electricity	15%	0% (no further change)
Gas Space Heating	20%	68%, all electric (COP* 0.80 → 2.50)
Gas Water Heating	10%	59%, all electric (COP 0.90 → 2.20)
Gas Cooking	0%	39%, all electric (COP 0.45 → 0.74)
Gas Laundry/Other	0%	11%, all electric (COP 0.90 → 1.00)

Considerations for Site EUI Target Setting

- State and local goals/requirements
 - State requirement for net zero direct GHG emissions by 2040
 - County climate goals (100% reduction in GHGs by 2035)
- Technical feasibility of meeting the target
 - Conservation and efficiency strategies
 - Efficient electrification strategies
- Costs of reaching the target
 - Up-front replacement costs
 - Ongoing operating costs
 - Available incentives, financing, and resources
- Available compliance paths
 - Inclusion of renewable energy allowance
 - Building Performance Improvement Plan option for "economic infeasibility" or other circumstances out of the owner's control
- Other additional background topics would be helpful to review before we start discussing site EUI targets?

Helpful Links

- Benchmarking and Performance Standards Law
- Benchmarking Website
- BEPS Website
- <u>Building Performance Improvement Board Website</u> (will include agendas, notes, and presentations)
- <u>BEPS Stakeholder workgroup + report</u> completed before bill was introduced to gather stakeholder input on BEPS policy elements
- <u>BEPS Technical Report</u> outlines options for site EUI targets by building type group and assesses feasibility and costs in representative case study buildings
 - <u>Presentation</u> of BEPS Technical Report to Council Transportation & Environment Committee
- <u>Allowance for Renewable Energy Technical Report and Recommendations</u> provides information on determining how a renewable energy allowance should be defined and implemented within BEPS regulations
- On weather and business normalization:
 - EPA technical reference guide on weather normalized energy use
 - EPA's Recommended Metrics and Normalization Methods for Use in State and Local Building Performance

 Standards document

Helpful Links (continued)

• Maryland Clean Energy Center 10/25 Webinar, Solutions to Achieve Building Energy Performance Standards recording

Questions?

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BPIB Webpage

https://www.montgomerycountymd.gov/green/energy/bpib.html

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